UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,892	03/31/2004	Peter N. Comley	38190/274036	5765

826 7590 03/30/2007
ALSTON & BIRD LLP
BANK OF AMERICA PLAZA
101 SOUTH TRYON STREET, SUITE 4000
CHARLOTTE, NC 28280-4000

EXAMINER	
BEVERIDGE, RACHEL E	
ART UNIT	PAPER NUMBER
1725	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

th

Office Action Summary	Application No.	Applicant(s)	
	10/813,892	COMLEY ET AL.	
	Examiner	Art Unit	
	Rachel E. Beveridge	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-12,16-23 and 36-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-12,16-23 and 36-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823) in view of Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), and Movchan et al. (WO 95/13406).

Weisert discloses an invention for diffusion bonding and superplastic forming hollow components such as aircraft engine components (i.e. gas turbine compressor fan blades) (Weisert, col. 1, lines 5-10). Weisert discloses superplastically forming "reactive" metals including titanium (Weisert, col. 3, lines 49-53) and further teaches a preferred material of Ti-6Al-4V superplastically formed at general temperature ranges including 1450°F-1750°F (Weisert, col. 4, lines 15-18). Weisert also teaches diffusion bonding the preferred Ti-6Al-4V material at 25-300 psi for about 30 minutes (Weisert, col. 4, lines 19 and 28). Weisert discloses heating each blank to within a diffusion bonding temperature range of each blank (Weisert, col. 4, lines 12-15), and diffusion bonding the first blank to the second blank (Weisert, col. 4, lines 59-64 and 15-19). Furthermore, Weisert discloses flat surfaces (14,20) positioned in abutting relation to each other of to the opposite flat sides of the intermediate flat core sheet (24), and

teaches subjecting the sheets (12,18,24) to diffusion bonding conditions in appropriate tooling (27) to bond the flat surfaces (14,20) to each other or to the core sheet (24) other than where the stop-off material was applied, thereby forming a diffusion bonded sandwich (29) (Weisert, col. 4, lines 56-64). See figure 2B. Weisert also discloses that superplastic behavior enhances formability under compressive strain conditions (Weisert, col. 3, lines 47-49). Therefore, the properties and method of invention are so similar with that of the applicant's claimed invention it is necessarily present to arrive at the specified strain rates of claims 11 and 12. However, Weisert lacks disclosure of specific grain sizes for the titanium blank and a diffusion bonding temperature less than 1450°F. Ruckle '207 generally teaches a superplastic titanium alloy with a grain size of about 1 micron (Ruckle '207, col. 4, lines 46-48 and col. 2, lines 63-67 through col. 3, lines 1-3). Ruckle '893 discloses diffusion bonding multiple titanium alloy blanks at a temperature of less than 1450°F (Ruckle '893, col. 2, lines 19-23). Combined the invention of Weisert, Ruckle '207, and Ruckle '893 lack specific disclosure of superplastically forming the titanium alloy blanks at a temperature of less than 1450°F; however, Movchan discloses superplastic deformation of titanium alloy blanks at temperatures between 650-760°C (1202-1400°F) and includes Ti-6Al-4V as example of such a titanium alloy (Movchan et al., p. 3, lines 22-26 and p. 5, lines 28-31). Thus, it is obvious to arrive at a common superplastic forming temperature between 1400°F and 1450°F based on both the disclosures of Weisert and Movchan (claim 10). Movchan also discloses strain rates for superplastic formation of titanium alloy of at least about 6 x 10^{-4} per second and 1 x 10^{-3} per second (Movchan et al., p. 5, lines 30-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26).

Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823), Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), and Movchan et al. (WO 95/13406) as applied to claim 1 above, and further in view of Stacher (US 5,118,026).

With respect to claim 5 and 6, Weisert, Ruckle '207, Ruckle '893, and Movchan lack disclosure of pickling the surface of the workpiece to remove any formed oxide during the superplastic forming step. Stacher discloses the fabrication of titanium aluminide sandwich structures that combines the process of metal joining and

superplastic forming (Stacher, col. 3, lines 26-29). Stacher states that titanium is particularly sensitive to oxygen, nitrogen, and water vapor content in the air at elevated temperatures (Stacher, col. 2, lines 33-35). Stacher further teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

With regard to claim 7, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed pickling rate. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Regarding claim 8, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of

pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed amount of oxide to be removed from the surfaces. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53).

With respect to claim 9, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Weisert also discloses the average thickness of the diffusion bonded sandwich between 5 mils (thousands of an inch) and about 150 mils (Weisert, col. 5, lines 6-10). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed thickness. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the thickness of Weisert in order to obtain a uniform mass distribution (thickness) of the sheets and therefore prevent rupturing of the truss core during superplastic forming (Weisert, col. 5, lines 16-19), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time

involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Claims 16-23 and 36-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823) in view of Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), Movchan et al. (WO 95/13406), and Stacher (US 5,118,026).

With respect to claim 16-19, 21-23, 36-39, 41, and 42, Weisert discloses an invention for diffusion bonding and superplastic forming hollow components such as aircraft engine components (i.e. gas turbine compressor fan blades) (Weisert, col. 1, lines 5-10). Weisert discloses superplastically forming "reactive" metals including titanium (Weisert, col. 3, lines 49-53) and further teaches a preferred material of Ti-6Al-4V superplastically formed at general temperature ranges including 1450°F-1750°F (Weisert, col. 4, lines 15-18). Weisert also teaches diffusion bonding the preferred Ti-6Al-4V material at 25-300 psi for about 30 minutes (Weisert, col. 4, lines 19 and 28). Weisert discloses heating each blank to within a diffusion bonding temperature range of each blank (Weisert, col. 4, lines 12-15), and diffusion bonding the first blank to the second blank (Weisert, col. 4, lines 59-64 and 15-19). Furthermore, Weisert discloses flat surfaces (14,20) positioned in abutting relation to each other of to the opposite flat sides of the intermediate flat core sheet (24), and teaches subjecting the sheets (12,18,24) to diffusion bonding conditions in appropriate tooling (27) to bond the flat

surfaces (14,20) to each other or to the core sheet (24) other than where the stop-off material was applied, thereby forming a diffusion bonded sandwich (29) (Weisert, col. 4, lines 56-64). See figure 2B. Weisert also discloses that superplastic behavior enhances formability under compressive strain conditions (Weisert, col. 3, lines 47-49). Therefore, the properties and method of invention are so similar with that of the applicant's claimed invention it is necessarily present to arrive at the specified strain rates of claims 22, 23, and 42 and the specified "about 1425°F" of claim 21. However, Weisert lacks disclosure of specific grain sizes for the titanium blank and a diffusion bonding temperature less than 1450°F. Ruckle '207 generally teaches a superplastic titanium alloy with a grain size of about 1 micron (Ruckle '207, col. 4, lines 46-48 and col. 2, lines 63-67 through col. 3, lines 1-3). Ruckle '893 discloses diffusion bonding multiple titanium alloy blanks at a temperature of less than 1450°F (Ruckle '893, col. 2, lines 19-23). Combined the invention of Weisert, Ruckle '207, and Ruckle '893 lack specific disclosure of superplastically forming the titanium alloy blanks at a temperature of less than 1450°F; however, Movchan discloses superplastic deformation of titanium alloy blanks at temperatures between 650-760°C (1202-1400°F) and includes Ti-6Al-4V as example of such a titanium alloy (Movchan et al., p. 3, lines 22-26 and p. 5, lines 28-31). Thus, it is obvious to arrive at a common superplastic forming temperature between 1400°F and 1450°F based on both the disclosures of Weisert and Movchan (claims 21 and 41). Movchan also discloses strain rates for superplastic formation of titanium alloy of at least about 6×10^{-4} per second and 1×10^{-3} per second (Movchan et al., p. 5, lines 30-31). The combined invention of Weisert, Ruckle '207, Ruckle '893,

and Movchan does not disclose pickling the surface of the workpiece to remove any formed oxide during the superplastic forming step. Stacher discloses the fabrication of titanium aluminide sandwich structures that combines the process of metal joining and superplastic forming (Stacher, col. 3, lines 26-29). Stacher states that titanium is particularly sensitive to oxygen, nitrogen, and water vapor content in the air at elevated temperatures (Stacher, col. 2, lines 33-35). Stacher further teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate

amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53) and to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

With respect to claims 20 and 40, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Weisert also discloses the average thickness of the diffusion bonded sandwich between 5 mils (thousands of an inch) and about 150 mils (Weisert, col. 5, lines 6-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Weisert in order to obtain a uniform mass distribution (thickness) of the sheets and therefore prevent rupturing of the truss core during superplastic forming (Weisert, col. 5, lines 16-19), and further to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-

26), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53) and to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Response to Arguments

Applicant's arguments filed January 5, 2007 have been fully considered but they are not persuasive.

Applicant argues that Ruckle '207 does not teach or suggest that the two members themselves can be formed of superplastic material and, in particular, a superplastic material having any particular grain size (page 8). The examiner understands the teachings of Ruckle '207 and acknowledges the teaching for sandwiching a superplastic material in between two surfaces. However, the examiner did not state that this limitation was taught or suggested by Ruckle '207, as that Ruckle '207 was cited for referencing specific grain sizes of superplastic formable titanium alloys. Moreover, Weisert discloses sheets of superplastic formable material that are diffusion bonded together (Weisert, abstract lines 2-5) (hence, clearly disclosing the applicant's limitation and argument), and Applicant's argument that Ruckle '207 does not teach or suggest this feature is moot since the primary reference of rejection clearly discloses this limitation. Also, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon

which applicant relies (i.e., "two members... formed of a superplastic material" (page 8)) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that Ruckle '893 does not teach the bonding temperature as claimed in claim 1, and that Ruckle '893 merely discloses that the temperature is usually selected for diffusion bonding can be as low as 870°C (1598°F), which is not less than 1450°F (page 8). The examiner understands that the temperature disclosed by Ruckle '893 is not exactly that limited by the claim; however, the Examiner reminds the applicant that the rejection of claim 1 is over more than one reference and not only in view of Ruckle '893. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, the examiner notes that Weisert discloses diffusion bonding titanium alloys (for example Ti-6Al-4V) with a stopoff material (for example Yittrium oxide) usually from about 150-600 psi (Weisert, col. 4, lines 22-26). This disclosure is equivalent to applicant's disclosure for diffusion bonding titanium blanks from pressures ranging from about 250-400 psi at temperatures of less than 1500°F (applicant's specification page 7). Ruckle '893 further discloses titanium alloys (without a stopoff material) with the temperature limits as cited in the rejection. Moreover, Ruckle '893 discloses that high temperatures of diffusion bonding are not

desirable for titanium alloys; implying that lower temperatures are necessary during diffusion bonding (Ruckle '893, col. 2, lines 24-35). Therefore, the examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Weisert to include a lower temperature diffusion bonding process (lower than 870°C) Ruckle '893 among the other references cited; because the references teach the same properties (materials, i.e. titanium alloys) and conditions (pressure and environment) for diffusion bonding as claimed and specified by the applicants invention. Put another way, Weisert and Ruckle '893 teach lower temperature diffusion bonding of titanium alloys to be an art recognized result effective variable depending on the type of material to be used. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify he invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26). That is it would have been obvious to one of ordinary skill in the art at the time of

the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Applicant then argues that the stated importance of the structure and the sensitivity to variations in the process of Movchan et al., that it would not have been obvious to modify the superplastic forming operation of the contrary materials of Weisert to conform to the process discussed by Movchan (page 9). The examiner disagrees. The applicant also alleges that if the materials of Weisert could have been modified to conform to the specifications discussed by Movchan, the materials would not have the refined grain structure of Claim 1, but would instead be characterized by grains having a long dimension such that the requirements for superplasticity would not be met in the third dimension (page 9). The examiner notes the applicant's argument; however, applicant has provided no evidence or support for this assumption. Also, the applicant's claim merely limits the grain size of the titanium blanks and does not claim any structure or dimensional aspects of the grains necessary for the blanks to maintain their superplasticity. And again the examiner reminds the applicant that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The applicant argues that the office action has not acknowledged any references as teaching the features of claim 10 for "superplastically forming the structural member

at a temperature between 1400°F and 1450°F" (page 9). The examiner disagrees and reminds the applicant that both Weisert and Movchan disclose superplastically forming titanium blanks within this temperature range (see pages 3-4 of the office action mailed on November 16, 2006).

Applicant then argues that the specified strain rates are neither disclosed by, nor inherent in, the process of Weisert, and that the dissimilarities of the material disclosed by Movchan and the materials of the other cited references lead to non-obviousness (page 10). The examiner disagrees. Moreover, Movchan discloses titanium alloys including an example of Ti-6Al-4V (as provided in the other references and by the applicant), where these titanium alloys are superplastically formable under given conditions. Hence Movchan discloses simply the same material as broadly disclosed by both the applicant and the other references without regard to any other minute features of the dimensions that applicant may be arguing. The applicant has not claimed features of their superplastic formable titanium alloys that would lead one of ordinary skill in the art to deem them different from any of the titanium alloys disclosed in all of the cited prior art. Also, applicant has not provided any evidence or support, from the references or from one of ordinary skill in the art, to their argument that the differences in materials between Weisert and Movchan would not have been obvious to apply the strain rates of Movchan.

In response to applicant's argument that there is no suggestion to combine the references (page 10), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the

claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26).

Furthermore, the applicant argues that Weisert teaches away from the modification suggested in the motivation by pointing to the avoidance of excessive strain rates as preventing rupturing of the structure (page 10). The examiner disagress and reminds the applicant that whether or not Weisert teaches away from the modification suggested by the examiner, the MPEP states, "patents are relevant as prior art for all they contain," more specifically stating,

> "The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain." *In re Heck*, 699 F.2d 1331, 1332-33, 216 USPQ 1038, 1039 (Fed. Cir. 1983) (quoting *In re Lemelson*, 397 F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968)).
>
> A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), *cert. denied,* 493 U.S. 975 (1989). See also *Celeritas Technologies Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998) (The court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed.") MPEP 2123 I.

With respect to claim 6, Applicant argues that the office action does not assert that Stacher discloses pickling a structural member to remove alpha case oxides formed thereon during a superplastically forming step (page 11). The examiner reminds the applicant that the other prior art references of record disclose the formation of alpha case oxides on the structural members during superplastic forming (more particularly, see Movchan, p. 2, lines 21-31). Stacher discloses pickling a structural member as a preparatory cleaning step to diffusion bonding (Stacher, col. 2, lines 44-55). Stacher also discloses the exposure to oxygen, nitrogen, and water vapor (hence, oxidation) that occurs during superplastic forming of titanium alloys (Stacher, col. 2, lines 29-37). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53).

The applicant then argues that claim 6 requires pickling after the superplastic forming step to remove alpha case oxide formed during superplastic forming, and that the references do not teach or suggest this feature of claim 6, and a person of ordinary skill in the art would not have be motivated to perform the claimed pickling step in order to affect a diffusion bonding operation that occurs prior thereto (page 11). The examiner disagrees. The examiner reminds the applicant that Movchan discloses the formation of oxidation occurring at elevated temperatures (specifically listed as 650-760°C, 1202-1400°F) during superplastic forming of titanium alloys. Thus, the prior art clearly suggests the formation of oxides during superplastic forming of Ti alloys, and it would have been obvious to one of ordinary skill in the art to utilize such a cleaning process (pickling) to remove oxides that formed during the superplastic forming steps of the prior art for the same or similar reasons that Stacher utilizes pickling to clean the surface of Ti alloys before diffusion bonding (because the unprotected, oxidized, Ti alloy become embrittled and its integrity is destroyed; Stacher, col. 2, lines 35-37).

With respect to claims 7-9, Applicant argues that the office action does not refer to any reference as teaching the features but simply asserts that the claims are obvious (page 11). The examiner reminds the applicant again that Stacher discloses pickling the surfaces of Ti alloys (where the oxides to be removed are often formed during superplastic forming), and it is *prima facie* obvious to arrive at the claimed ranges for a pickling rate on the same materials under the same/similar conditions at the other prior art cited of record and as disclosed by the applicant. Put another way, Stacher teach pickling titanium alloys to remove oxide from the surface to be an art recognized result

effective variable depending on the type of material to be used. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36). That is it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Applicant also argues that claims 16 and 36 include features similar to those discussed previously, so each of claims 16-23 and 36-42 should be patentable over the cited references for all of the same reasons previously argued (page 12). The examiner disagrees for all of the reasons discussed above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rachel E. Beveridge whose telephone number is 571-272-5169. The examiner can normally be reached on Monday through Friday, 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JONATHAN JOHNSON
PRIMARY EXAMINER

reb
March 22, 2007